Specification

The invention relates to a radio receiver for automotive applications.

Previously known radio receivers for automotive applications, also called car radios, are as a rule provided with an RDS demodulator, with whose aid information items concerning the alternative reception frequencies of a program are obtained from the RDS data stream. With the help of these data, a so-called AF list is created. Further, the car radio has a quality evaluation unit, which is capable of assessing the program currently being received as to reception quality and changing the car radio over to another alternative frequency on the AF list of the program currently being received if the reception quality falls below a defined quality threshold. This process is repeated until there is adequate reception quality above the quality threshold. In this way it is ensured that the reception quality of a program currently being received is usually set to an adequate level and thus made available to the user for listening. A characteristic identification (PS code) of the received program can also be presented in a display of the car radio with the aid of the RDS data. A simple recognition of the received program and its differentiation from other programs is thus achieved by the user in simple fashion. These car radios have the disadvantage that a purposeful changeover to a program having presumably better quality is possible only within the AF list.

The goal of the invention is to create a radio receiver for automotive applications that always ensures reception of the highest possible quality and wherein operability by the user is simplified so that traffic safety is enhanced to the greatest possible degree.

This goal is achieved according to the invention with a radio receiver for automotive applications having the features of Claim 1.

Advantageous developments appear in the dependent claims.

According to the invention, the radio receiver for automotive applications has a housing in which there are mounted two tuners, a quality evaluation unit, a unit for determining the radio station having the best quality and an amplifier stage, and whereon there are arranged a display and a control element upon whose actuation the listening tuner is changed over to the station having the best quality.

One of the two tuners is designed as the listening tuner, that is, the signal received by it is forwarded to the amplifier stage, which amplifies the received radio signal after its preparation by the listening tuner and makes it available at a device output for output to the loudspeaker. The second tuner, the background tuner, is so designed that it repeatedly searches the receivable frequency band for receivable stations without affecting the listening tuner, that is, independently thereof, and assesses the received stations as to their quality with the assistance of the quality evaluation unit. From these received, quality-evaluated stations, that station that exhibits the best quality is determined. In this way it is ensured that, after every check of the frequency band with the associated quality evaluation and so forth, the currently best station in the entire frequency band is always determined. Along with the identification of the program currently being listened to, the station having the best quality is indicated in the display by an identification representing it. If a specific control element on the radio receiver is actuated, the listening tuner is changed over to the station having the best quality, whose identification is represented in the display, and the identification of the station currently

being listened to is replaced by the identification of the station having the best quality. In this way it is ensured that the best possible reception is always achievable through a possible changeover, this taking place in a manner completely independent of the station currently being received and listened to. The received station can have as its content a totally different program from the station having the best quality.

The display is divided into segments, one of which is provided for representing the characteristic identification of the station currently being listened to and one for representing the identification of the station having the best reception quality. The segment for representing the identification of the station having the best quality is arranged spatially close to the control element for the changeover to the station having the best quality. In this way it is ensured that actuation of the control element is very simple and purposeful even in difficult driving situations leaving less concentration for operating the radio receiver. Through the functional association of "changeover to the best station having the characteristic identification represented in the corresponding segment," this is achieved by the close spatial placement of the control element and this corresponding segment. This improvement in driving safety is additionally reinforced in that the driver of the vehicle is offered not a multiplicity of stations with good reception but just the one station, namely the station having the best quality, so that in the case of the changeover according to the invention, distraction from concentration on traffic occurs for only a very short time. In this case, specifically, the time needed for recognizing the various offerings and for making a selection from the various offerings—exactly what is not desired according to the invention—is eliminated.

Furthermore, the user can always achieve optimal reception by a single actuation, the user always being able also to recognize the type of radio program from the representation of the identification of the station having the best quality. In this way, operational guidance is very pleasant and the operability of the radio receiver is very safe, a point of particular interest particularly in the case of a car radio with continuously changing reception conditions and steadily growing demands on the vehicle driver's concentration and attentiveness for driving the vehicle, and thus the ever-diminishing residual concentration left over for operating a car radio or similar device.

According to a preferred embodiment, the background tuner is so designed and controlled that it scans the entire frequency band regularly, particularly at fixed time intervals, and thus searches for receivable stations. This ensures that the quality information, in particular the determination of the station having the best quality, is especially current, a point of particular interest precisely in difficult spatial reception locations, for example in tight, narrow valleys, and a significant improvement in user-friendliness and thus user acceptance for the car radio is achieved only when there are reliable data that are as current as possible.

It has proved to be particularly advantageous to make the time interval between two scans dependent on the quality value of the station having the best quality. If the quality value should be very low, it is advantageous to perform the next scan at a very short time interval, for example 30 seconds, while in the case of high quality values, that is, when reception is very good, the interval between two scans can be increased significantly, for example severalfold. In this case, time intervals of several minutes have proved very advantageous. In the times between scans, the background receiver can be used for

other tasks, for example for assessing the reception quality of the alternative frequencies from the AF list that are transmitting the same program as the station currently being listened to. In this way it can also be ensured that a safe, fast changeover within the alternative frequencies while maintaining the same program is possible if needed. This is in particular made possible in a particularly advantageous fashion when the time interval is chosen, as described, in dependence on the quality value of the station having the best quality.

Furthermore, it has proved to be particularly advantageous to make the time interval between two scans dependent on the quality value of the station being listened to, that is, the station being received by the listening tuner. If the quality value of the station being listened to should be very low, then in view of the increasingly unsatisfactory reception quality of the program being listened to and the associated higher probability that the user wishes to change over, it is advantageous to perform the next scan at a very short time interval, for example 30 seconds, while in the case of high quality values, that is, when reception is very good, the interval between two scans can be increased significantly, for example severalfold, since here the desire to change over is less probable. In this case, also, time intervals of several minutes have proved very advantageous. In the longer times between scans, the background receiver is available for other tasks.

According to a preferred embodiment, the radio receiver is so designed that, between scans, the background tuner is preferably tuned to the station having the best quality. According to the invention, if the control element for initiating a changeover of the listening tuner to the station having the best quality is actuated, the pretuned background tuner becomes the listening tuner, in that its received and prepared radio signals of the station having the best quality are forwarded to the amplifier stage and there, after amplification, fed to the output for output to the loudspeaker. While the background tuner is becoming the listening tuner, the former listening tuner becomes the background tuner and takes over its function of monitoring the receivable frequency band for receivable stations. This changeover between listening tuner and background tuner guarantees a virtually gap-free audio signal that exhibits no audible pause upon the changeover from the station originally being listened to to the station having the best quality. In this way, a very pleasant changeover to the desired best station is achieved, which substantially enhances user acceptance of the radio receiver for a changeover.

The radio receiver is preferably provided with a memory in which there are stored stations or programs that need not be considered in determining the station having the best quality. In order to store stations in this memory, the radio receiver is placed in a functional mode wherein these stations or programs are selected step by step and are selected by actuating a corresponding control element, which can be identical with the control element for initiating the changeover. Through this negative selection, it is ensured that the user is regularly offered, as stations having the best quality, only such stations as correspond to his listening opinion and listening taste. In this way it is guaranteed that the radio receiver reproduces stations adapted to the individual needs of the user and not such stations which, on the basis of his experience, he does not care to listen to. Such a radio receiver having such operational guidance shows particularly high acceptance among listeners. Especially also in view of the fact that repeated changing over between various stations, which is always associated with a

brief diversion of the driver's attention from the traffic to the car radio, can be prevented, which leads to an improvement in driving safety.